CHAPTER 3

Seascape: final results of a socio-economic study

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In 2002 and 2009 two sociological seascape surveys took place in Belgium. These surveys focused on both the visual and overall experience. People's general opinion on wind energy and on the local planned wind farms were asked. Results show that in 2002 there was already a majority in favor of wind farms and this number still increased by 10% in 2009. A future survey is proposed to take place in the summer after the first wind turbines of the wind farms closest to the land have been installed. At that time at least three other wind farms will also be operational.

INTRODUCTION

Feenstra (2013) mentions that the lack of social acceptance also called NIMBY (Not In My Backyard) has become the third most important challenge of energy project developers worldwide, in addition to financial and regulatory issues. The NIMBY label is heavily discussed in research: where in the early years of wind farm development the NIMBY attitude – preferring technical siting elsewhere- was frequently used to explain opposition to new developments, more recent research has focused on looking for the reasons underlying opposition or support (Devine-Wright, 2008; Firestone et al. 2009; Haggett, 2011 and Wolsink, 2000 and many more). As part of the licensing conditions for the first offshore wind farms in the Belgian part of the North sea, a socio-economic study was conducted. This research focuses on people's opinion on renewable energy in general and opinions on specific projects in the Belgian part of the North sea. It tries to get an insight on underlying reasons for people's attitudes towards renewables and offshore wind energy in particular.

RESEARCH STRATEGY

When did we survey?

Since Belgium has little experience with sociological land(sea)scape studies, a research methodology was used that is very well known in other countries (Krohn and Damborg, 1999 and Wolsink, 1996) where a long experience exists of measuring perceptive effects of infrastructural works within a certain landscape.
This particular sociological survey focuses on both the visual experience and "total experience" of the perception of the surroundings and landscape. This kind of survey usually has a wide scope and will investigate the (changes in) quality of the life of the respondents and will attempt to relate this to several effects simultaneously.

In 2002 a first sociological seascape survey (WES, 2002; WES, 2003) took place in Belgium to study acceptance and assessment of renewable energy and more specifically of offshore wind farms in Belgium. For this purpose 405 persons (137 coastal residents, 67 second residents, 13 coastal workers and 188 tourists) were interviewed face to face at the coast. During the summer of 2009 a public inquiry (Houthaeve and Vanhulle, 2010) was held to check for comparable results since 2002. Similar to the study of 2002, the methodology of the 2009 study included a public inquiry of 1000 persons, particularly coastal inhabitants (235), tourists (257 daytrip tourists, 244 overnightstay tourists), second residents (222), sailors and coastal workers (42). Researchers wanted to know if eventually acceptance changes as wind farms are constructed (integration of perception/acceptance). Respondents were asked their opinion on the construction of offshore wind farms and the results were compared to the results of 2002 (Figure 1).

Six wind turbines were already built in 2008.To investigate the impact of these already built wind turbines at sea simulations of the offshore wind farms, as well as the actual view from the coastline, were used. Photomontages were used for calibration purposes.

For these montages a real view picture base layer was used, whereas for the photo simulation a base layer of a neutral sea picture was used. On this base layer a simulation of the wind turbines was added digitally to give an impression on what the situation would look like with real wind turbines. Using this technique a large number of viewpoints and angles can be simulated taking into account different wind farm configurations, turbine types,... The use of a neutral base layer is important because the simulations are used in the inquiries for the sociological landscape study and the evaluations made by the interviewed people may not be influenced by random distractions on the photo like e. g. ships, objects on the beach, etc. Sunny weather conditions were used on all simulations. Respondents were asked to evaluate four different simulations (presented on high quality paper photographs with a 20x30 cm format): a first one showing wind turbines of the three permitted projects, followed by a simulation of the Belgian wind farm area fully occupied with wind turbines (worst cases scenario) (Figure 7). Also a simulation of a night view and a simulated situation at sea (at a distance of 2 km from the wind farm) were shown.

What did we ask to the people?

To find out how people think about a certain subject the selection of the questions asked during the enquiry are of utmost importance and lot of effort is spent in selecting the questions to be asked during the survey. Questions used in the 2009 survey were based on the previous study of 2002. The questionnaire had six different parts, each linked to a specific objective:

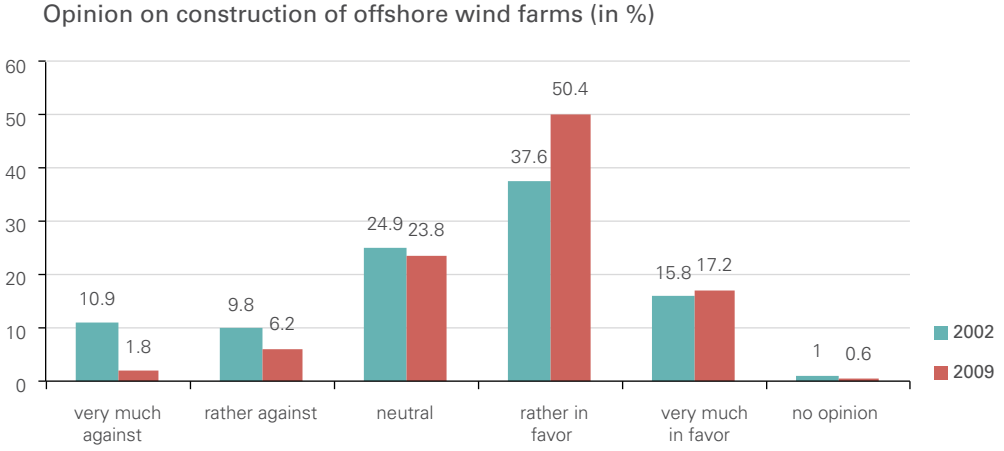
- the first part of the questionnaire focused on the relation of the respondent with the coast side in order to determine the frequency with which the respondent is in contact with the view of offshore wind farms e.g. "how many times do you visit the coast";
- the second part examined the social relevance of sustainable development by proposing a number of statements on wind farms and wind energy in general; this in order to gage the respondents opinion on this matter and see if the people's opinion had changed according to the previous survey in 2002;
- the third part sounded the experience of the actual wind farm, how the visual impact is appreciated from the dyke, what the impact was of the turning blades what the impact of lights in bad weather conditions or at night are;
- the fourth part of the questionnaire looked into the effects the wind farm has on the behavior of people (perception, acceptance,...) e.g. "will you still visit the coast if this wind farm is to be built?";
- the fifth part focused on the cumulative impact of the second and third wind farm planned in the wind farm area; photo simulations were used for this part;
- the last part focused on socio demographic information of the respondents (age, education level, etc.).

RESULTS

Did people's opinion change in time?

Figure 1 shows that, in 2009, more than half of the respondents (50%) said to be rather in favor of the construction of offshore wind farms and 17% is even very much in favor thereof. A small minority of 8% is (rather) against offshore wind farms. The number of persons with a positive attitude has risen by 10% in comparison with 2002. Generally, people still find the quality of the seascape very important: the wide sea view and the openness, naturalness and the tranquility of the sea. Kuehn et al. (2005) mentions that interviewers for the Horns Rev wind farm in Denmark revealed that many of the opponents modified their views after construction of the farm. Ladenburg et al. (2005) gives the figures for this statement: two years after the construction, 12 % of residents felt the wind turbines negatively impacted the view and 89% supported new offshore developments in Denmark. A survey conducted in 2005 in USA for the Cape Cod offshore wind farm showed that a majority of the Cape Cod residents (55%) were opposed to the project (and 44 % supporters). A more recent survey conducted in 2007 showed that the project has been gaining support amongst residents with 61% of residents supporting the development of the Cape Cod offshore wind farm and 36% opposing (2% unsure) (Firestone et al, 2009) .

Figure 1. Opinion on construction of offshore wind farms, survey 2009 compared to survey 2002 (in %).



Age doesn't matter, gender does

People living at the coast and sailors are less in favor of construction of offshore wind farms than people living further inland, but both groups still remain predominantly positive. Firestone (2009) mentions comparable conclusions for the Cape Cod and Delaware projects in USA. Age did not matter in the opinion on offshore wind farms but gender did, with men being slightly more positive than women. Also more people are in favor when they had a higher education. As the higher educated people are more represented in the respondents group this opinion on the construction of offshore wind farm is globally too positively presented. Nevertheless similar results were found for the Cape Cod wind farm where the supporters of wind farms had higher educational background attainment (Nordman, 2011).

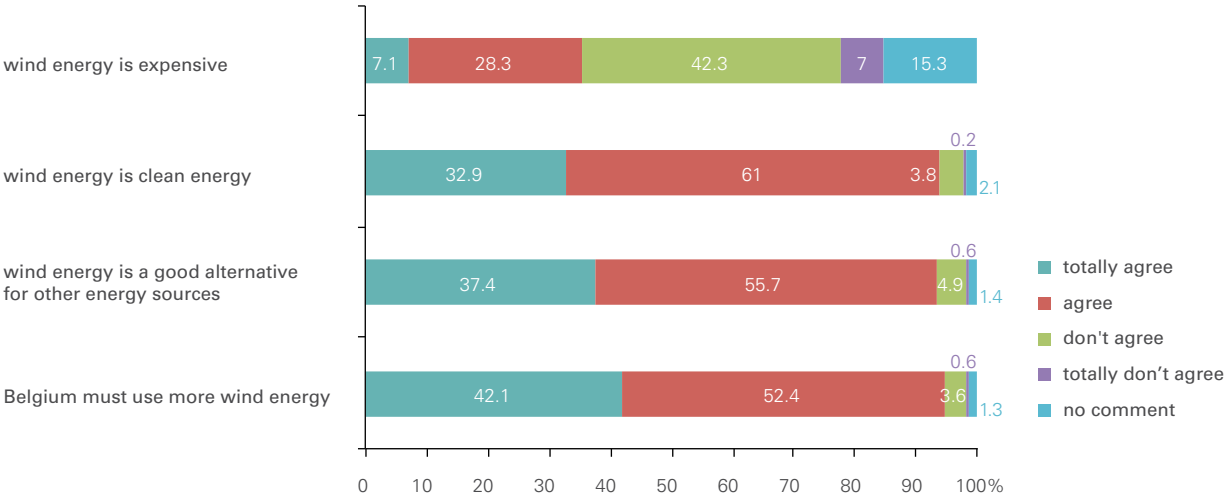
Opinion about wind energy

Here we look at people's opinion about wind energy in general and offshore wind energy in particular.

Wind energy in general and applicability of wind energy

Following statements on **general wind energy subjects** were proposed to the people.

Figure 2. Agreement / disagreement with the statements on wind energy in general, survey 2009 (in %).

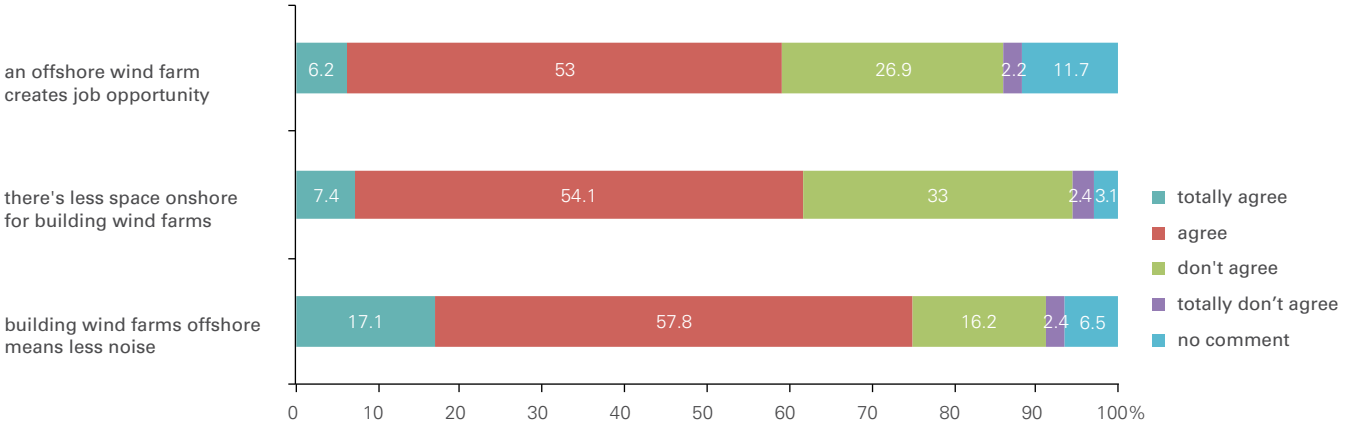


Almost everyone (95 % of the respondents) is strongly convinced that Belgium should use more wind energy, almost 94% agrees that wind energy is a clean energy. Almost everyone (93%) also agrees that wind energy is a good alternative for other classic energy sources; about 6% doesn't agree (totally), 1% has no opinion. It's striking how much people agree with these statements on wind energy in general.
The last statement gathers information on the financial implications of wind energy. It is notable that on this statement opinions are divided. More than one out of three agrees that wind energy is expensive. Quite a lot of people (15%) do not have an opinion on this subject; half of the respondents (49%) do not agree (totally) that wind energy is expensive.
The above results indicate that while the respondents in general considered wind energy to be a clean and sustainable energy source there is still uncertainty about the costs.

Offshore wind energy

Three statements sound people's opinion on the **advantages** of an offshore wind farm.

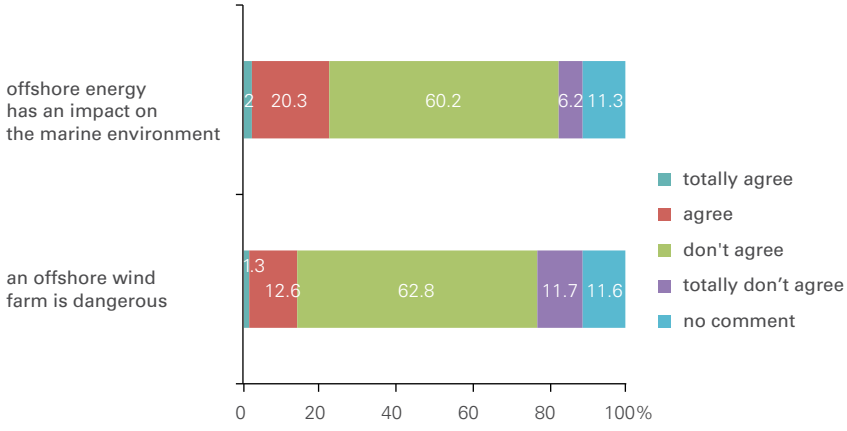
Figure 3. Agreement / disagreement with the statements about advantages of an offshore wind farm, survey 2009 (in %).



Globally a fairly positive perception of the siting on wind farm offshore rather than onshore is set forward. Almost ¾ of the respondents is convinced that at sea there's little or no burden of noise from a wind farm and more than 61% thinks moreover that more space is available for wind farms offshore than onshore. Still one out of three does not agree with this statement. Almost 60% of the respondents think that an offshore wind farm will bring more work to the region whereas less than 30% is in (total) disagreement with this statement. For this particular advantage respondents hesitated the most (almost 12% 'no opinion'). Nevertheless, since 2012, the harbour of Ostend (Belgium) which reoriented strategically to an energy port has experienced that a wind farm developer brings lots of side activities to a harbour (maintenance companies, electrical companies, boat transfer companies…). Due to the offshore industry in general 956 people were working in the front part of the harbour (where the wind farm industry is localized). This number is without counting for all temporally workers for the building of the wind farm, nor for the crew on the vessels in the building area. The wind farm industry doubled the number of ship transfers in/out the port to 4500 movements in 2012. A survey conducted one year after construction of the Nysted offshore wind farm (Denmark) indicated that 86% of respondents were supportive of new offshore wind farms in Denmark as a new turbine manufacturing plant brought jobs to the area, which had relatively high unemployment (Ladenburg et al., 2005).

Two statements sound people's opinion on the **disadvantages** of an offshore wind farm.

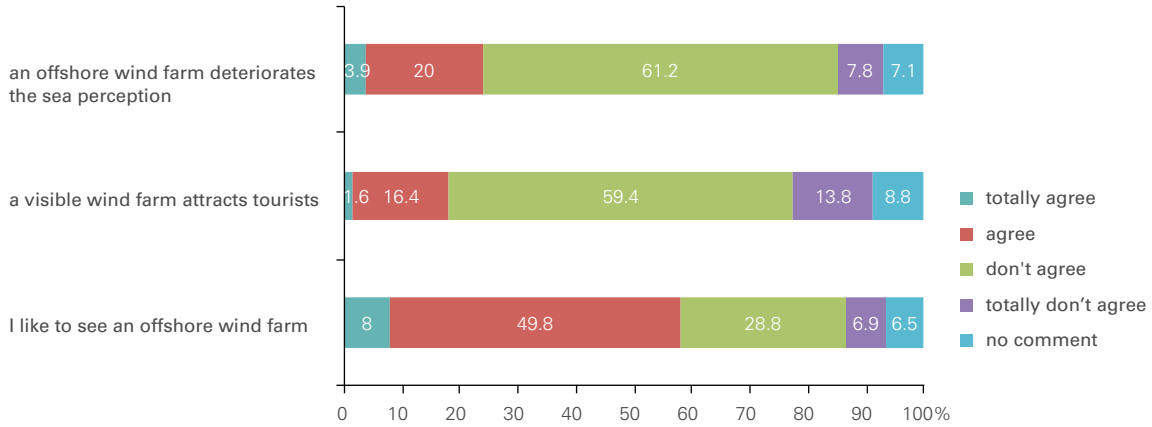
Figure 4. Agreement / disagreement with the statement about the disadvantages of an offshore wind farm, survey 2009 (in %).



Almost ¾th of the respondents do not believe (at all) that an offshore wind farm could be dangerous, although almost 12% has no opinion. The wording of this questions could have been better chosen: replacing 'dangerous' by 'risky' probably would give other responses. 2 out of 3 respondents expect that a wind farm does not affect the marine environment. Almost 25% of the respondents think that a wind farm affects nature although it is not specified if this effect would be positive or negative. Gee (2010) described in a similar German study that 15% of all arguments employed, were arguments on nature conservation and these were mostly exclusively used to object to offshore wind farms. In that study the nature conservation category was very diverse with arguments covering indistinct fears that offshore farms will harm the marine ecosystem and also fear of very specific negative impacts on bird and marine mammal species. The category also comprises indirect impacts, such as oil spills resulting from tanker collision with a wind farm.

Assessing people's **opinion on how the visibility** of an offshore wind farm **affects acceptance** was done by using following statements:

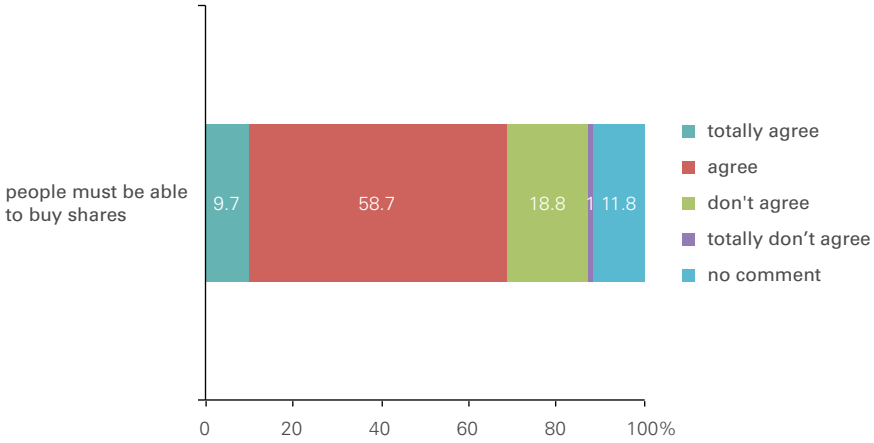
Figure 5. People's opinion on the view of an offshore wind farm, survey 2009 (in %).



More than half of the respondents (58%) (totally) would like to see an offshore wind farm. More than 1/3rd of the respondents (totally) would not like to look at a wind farm at sea.
A comparable, more generally formulated statement generates more positively results: almost 70% (totally) don't agree with the statement that a wind farm at sea will affect the 'sea perception', and only 24% agree. A majority of the respondents don't think that a visible offshore wind farm will attract more tourists, only 18% agrees (totally) with this statement.

Finally people's opinion on the **possibility of buying shares** of wind farms was surveyed.

Figure 6. People's opinion on the possibility of buying shares of an offshore wind farm, survey 2009 (in %).



More than 60% of the respondents (totally) agree that citizens should be able to buy shares of a wind farm. About 12% has no opinion about this and almost 1 out of 5 (totally) doesn't agree with this statement. Currently, at least one offshore wind farm in Belgium offers the possibility of participation by buying shares.

Photo simulations and photo montages

Worst case: Belgian wind farm area completely built[1]

After viewing a photo simulation in which the entire Belgian wind energy zone is operational (Figure 7), respondents were asked if the distance from the wind turbines to the beach is acceptable (i.e. large enough). More than 62% of respondents think this distance is acceptable with 13% finding it a rather acceptable. However 20% of respondents found the distance unacceptable, (in addition to 5% having no opinion). People indicating finding the distance unacceptable were asked under which conditions this fully built area would become acceptable. For 84% of those respondents it would become more acceptable if the wind farms were less visible, 69% wanted the wind farms to have another (less visible) orientation/set up, 56% would find it more acceptable if the wind farms would provide them with cheap energy, 53% if there's no harm for nature, 43% if the wind farms would provide economic growth and employment, 23% if people could buy shares and finally 20% if the park could be visited.

In general the results of the survey are similar to those published in the international literature regarding the perception of wind farms. Nordman et al. (2011) states that the researchers for the Cape Cod project (USA) found following patterns: residents expected positive impacts on job creation, electricity rates and air quality; many respondents would increase their support if Cape Cod received the electricity, if electricity rates decreased, if local fishing was helped and if air quality improved. The location of turbines and their visibility from the shore is clearly an important factor. In a coastal region of Germany, where 54% of coastal residents disagreed with a planned offshore project aesthetics was cited as the most common reason for opposition, while energy was the primary reason for support (Gee, 2010). Ladenburg et al. (2005), Firestone et al. (2009), Devine-Wright P. (2008) and Hübner and Pohl (2013) found that people consistently prefer wind farms located further from shore. However, the benefit that people perceived from moving a hypothetical wind farm an additional mile offshore diminishes with distance. That is, people are more sensitive to the difference between a wind farm at six versus seven miles from shore, than when comparing a wind farm at 12 versus 13 miles (Ladenburg et al., 2005).

From the before mentioned results it can be concluded that the perception value of the sea is influenced by the wind turbines at sea. In addition, the degree of visibility was found to influence acceptance. In our survey variations in the distance offshore, the orientation as seen from the coastal towns and the number of visible wind turbines were simulated. When the wind turbines were simulated at a sufficiently large distance and/or are limited in number, a fundamental change in this perception is prevented, which added to the acceptance. Aside from these visual factors, ecological and economic factors also play a rather important role in the degree of acceptance.

[1] **Other cases** are described in (Vanhulle, A. et al, 2010)

Figure 7. Simulation of the fully occupied wind farm area seen from the dyke in Blankenberge (Simulation and montage: Grontmij, 2010).

What do people want to be informed of?

As a last question respondents were asked on which aspects of offshore wind energy they would like to be informed. The most common answers given are shown in figure 8.

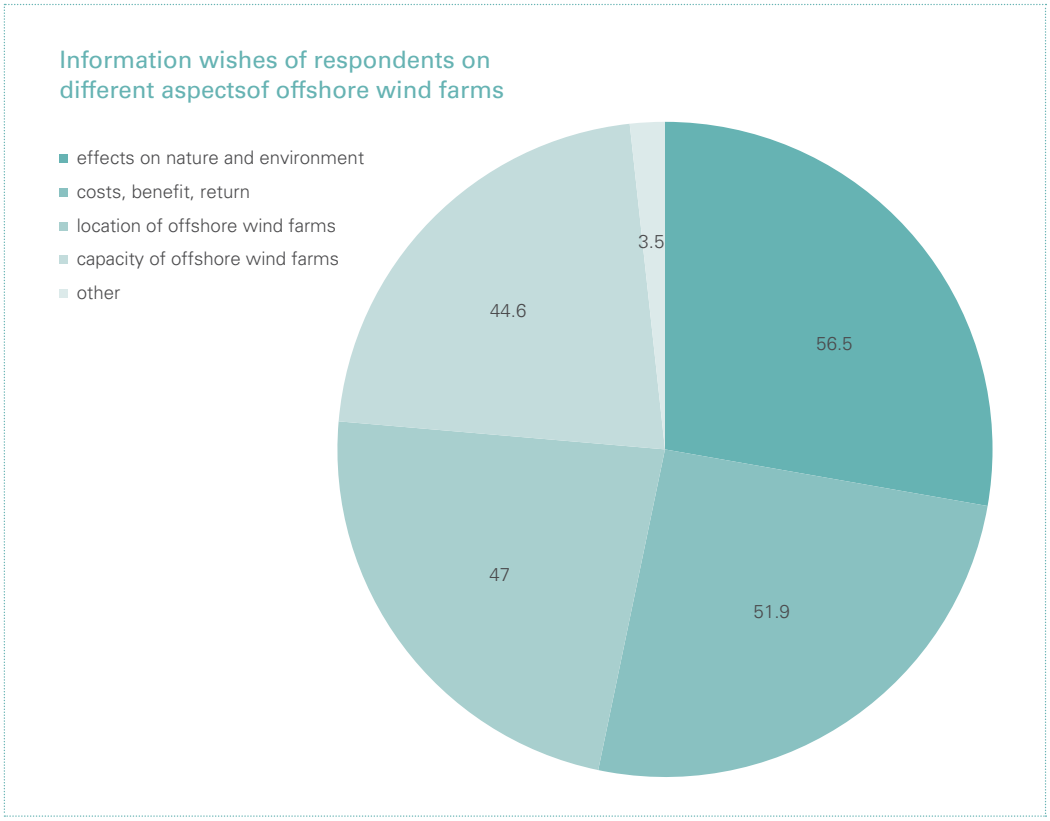


Figure 8. Information wishes of respondents on different aspects of offshore wind farms, survey 2009 (in %).

FUTURE MONITORING

Determining how peoples' perception has changed five years after the initial study could be the subject of a new socio-economical study in the (near) future. This study could focus on changes in people's opinion now that a number of parks are operational. The wind farms closest to the coast are visible and real time view on the offshore wind farms can now be used to validate photo simulations. The impact of the works on local lives (visual perception but also opportunities for local work) can be included and finally, as utility bills are rising, it would be interesting to see if and how people link this fact to local offshore wind projects. Such a follow up study is proposed to be done the summer after the first wind turbines of the wind farms closest to the land have been installed. At that time at least three other wind farms will also be operational.

With 53.2% of the people indicating that the worst-case scenario (fully occupied zone) would become acceptable if there is no damage to the marine environment and with results of the survey indicating (Figure 8) that the most important thing people want to be informed about is the effects on nature and environment one could say that the Belgian government was correct in implementing an extended monitoring programme when permitting the first wind farm. The following chapters describe the results of the different research programmes related to the environmental impacts of offshore wind in the past 5 years. These aim to provide the general public and the scientific community with a more robust knowledge on the possible impacts and allow the reader to develop his/her own opinion on the effects of offshore wind farms.